

STS-106 (4th International Space Station Flight)

Atlantis

Pad B

99th Shuttle mission
22nd Flight of OV-104
52nd KSC landing

Crew:

Terrence W. Wilcutt, Commander (4th Shuttle flight)
Scott D. Altman, Pilot (2nd)
Edward Lu, Mission Specialist (2nd)
Yuri I. Malenchenko, Mission Specialist (1st)
Boris V. Morokov, Mission Specialist (1st)
Richard A. Mastracchio, Mission Specialist (1st)
Daniel C. Burbank, Mission Specialist (1st)

Orbiter Preps (move to):

OPF Bay 3 – May 29, 2000
VAB – Aug. 7, 2000
Pad 39B – Aug. 13, 2000

Launch:

Sept. 8, 2000, 8:45:47 a.m. EDT. STS-106 launched as planned at 8:45 a.m. with no unscheduled holds during the flawless countdown.

Landing:

Sept. 20, 2000, 3:58:01 a.m. EDT. Runway 15, Kennedy Space Center, Fla. Rollout distance: 9,127 feet. Rollout time: 1 minute 13 seconds. Mission duration: 11 days, 19 hours, 12 minutes, 15 seconds. Landed on orbit 185. Logged 4.9 million statute miles. Landed on first opportunity at KSC, marking 23rd consecutive landing in Florida and the 30th landing of a Shuttle at KSC in the last 31 flights.

Mission Highlights:

STS-106, during its 11-day mission to the International Space Station (ISS), completed all assigned mission objectives to prepare the Station for the first crew scheduled to launch in October. The mission to the 143-foot-long Station focused on unloading nearly three tons of cargo from the orbiter and a Progress supply craft already docked to the opposite end of the ISS.

On flight day two, Atlantis completed a successful rendezvous and docking with the ISS in early morning setting the stage for six days of outfitting.

A 6 hour and 14 minute Extravehicular Activity (EVA) was completed successfully on day three, 16 minutes ahead of the planned schedule, by Lu and Malenchenko. The spacewalk's objective focused on routing and connecting nine power, data and communications cables between the Zvezda module and the other Russian-built module, Zarya, as well as installing the six-foot-long magnetometer to the Station to serve as a compass showing the Station in respect to the Earth. Lu and Malenchenko used tethers and handrails along the ISS to make their way to a point more than 100 feet above the cargo bay, the farthest any tethered spacewalker has ventured outside the Shuttle. They completed this with the assistance of their inside crewmates Burbank and Mastracchio who deftly maneuvered them around with the robotic arm. This spacewalk celebrates the sixth spacewalk in support of the Station assembly and the 50th spacewalk in Space Shuttle history.

On flight day four the crew entered the International Space Station through Pressurized Mating Adapter-2 (PMA-2) to begin the transfer operations of more than three tons of hardware and supplies. Atlantis' crew was the first to see the interior of the Russian Zvezda service module since it was launched from the Baikonur Cosmodrome in July. Additionally, a reboost was performed using the orbiter's Reaction Control System (RCS) to place the Station in a higher orbit.

Transfer of supplies and maintenance tasks continued well into the fifth day, while orbiter consumables remain above the required levels allowing managers to extend the mission one additional day.

Activities on flight day five included the installation of three batteries inside Zvezda. In order to reduce the weight for launch, Zvezda was launched with only five of its eight batteries in place.

Lu and Malenchenko spent much of flight day seven installing voltage and current stabilizers in Zvezda. Components of the Elektron system, equipment sent into orbit to separate water into oxygen and hydrogen, were installed and will be activated after the first crew arrives.

The crew transferred more than 6,000 pounds of material – including six, 100 pound bags of water, all of the food for the first resident crew, office supplies, onboard environmental supplies, a vacuum cleaner and a computer and monitor – to the interior of the Station.

The astronauts spent a total of 5 days, 9 hours and 21 minutes inside the Station before closing the hatch on the orbiting outpost. Wilcutt and Altman commanded a series of four altitude boosts to place the Station in an orbit of approximately 241 by 233 statute miles, raising the average altitude by 14 miles. After spending 7 days, 21 hours and 54 minutes linked to the Station, Atlantis undocked at 6:45 p.m. EDT as Wilcutt and Altman fired Atlantis' jets to move to a distance of about 450 feet for a double-loop flyaround.

STS-97 (6th International Space Station Flight (4A))

Endeavour

Pad B

- 101st Shuttle mission
- 15th Flight of OV-105
- 53rd KSC landing

Crew:

- Brent Jett, Commander (3rd Shuttle flight)
- Michael Bloomfield, Pilot (2nd)
- Joseph Tanner, Mission Specialist (3rd)
- Carlos Noriega, Mission Specialist (2nd)
- Marc Garneau, Mission Specialist (CSA) (3rd)

Orbiter Preps (move to):

- OPF Bay 2 - Feb. 23, 2000
- VAB - Oct. 25, 2000
- Pad 39B - Oct. 31, 2000

Launch:

November 30, 2000 at 10:06 p.m. EST. Endeavour blasted off on time from Launch Pad 39B at the Kennedy Space Center on the 101st mission in Space Shuttle history. The crew of five astronauts were on the sixth construction flight for the International Space Station (ISS). There were no unscheduled holds during the flawless countdown.

Landing:

December 11, 2000 at 6:04:20 p.m. EST. Landed on first opportunity at KSC, Runway 15, Kennedy Space Center, Fla. Main Gear Touchdown: 6:03:25 p.m. EST. Nose Gear Touchdown: 6:03:34 p.m. EST. Wheel Stop: 6:04:20. Rollout time: 57 seconds. Mission Elapsed Time: 10 days, 19 hours, 58 seconds. Distance on orbit: 4,476,164 million miles. Endeavour landed on orbit 171, its first attempt, marking the 16th night landing in Florida and the 53rd KSC landing in Space Shuttle history.

Mission Highlights:

On their 11-day mission, the astronauts completed three spacewalks, or EVAs, to deliver and connect the first set of U.S.-provided solar arrays to the International Space Station, prepare a docking port for arrival of the U.S. Laboratory Destiny, install Floating Potential Probes to measure electrical potential surrounding the Station, install a camera cable outside the Unity module, and transfer supplies, equipment and refuse between Endeavour and the Station.

On Flight Day 2, Commander Brent Jett linked Endeavour to the ISS while 230 statute miles above northeast Kazakhstan.

The successful checkout of the extravehicular mobility units (EMUs), the Simplified Aid for EVA Rescue (SAFER) units, the Remote Manipulator System (RMS), the Orbiter Space Vision System (OSVS) and the Orbiter Docking System (ODS) were all completed nominally. Also, the ODS centerline camera was installed with no misalignment (as experienced on other flights) noted.

From inside Endeavour, Mission Specialist Garneau used the RMS to remove the P6 truss from the payload bay, maneuvering it into an overnight park position to warm its components. Mission Specialists Joseph Tanner and Carlos Noriega moved through Endeavour's docking tunnel and opened the hatch to the ISS docking port to leave supplies and computer hardware on the doorstep of the Station. The next day the Expedition One crew – Commander Bill Shepherd, Pilot

Yuri Gidzenko and Flight Engineer Sergei Krikalev – entered the Unity module for the first time and retrieved the items left for them.

EVA No. 1 – Tanner and Noriega mated the P6 to the Station's Z1 truss. The starboard or first half of the P6 solar array was unfurled only after several repeat commands were given because not all of the pins would release at first. The release of the port array was delayed to allow controllers to understand the problem encountered. Also deployed was one of three photovoltaic radiators that will dissipate heat generated by on-board electronics. The space walk lasted 7 hours, 33 minutes.

Later, the second solar wing was deployed slowly, with stops and starts. Two rows of solar panels stuck together but were loosened by retracting then extending the arrays again. The deployment brings the span of the solar arrays to 240 feet wide and 38 feet across.

EVA No. 2 – Tanner and Noriega worked to reconfigure electrical connections so that power from the P6 solar arrays can flow to the U.S. elements of the Station. They also prepared a docking port, Pressurized Mating Adapter 2, for its move from the forward end of the Unity module in January to another area on the Space Station. That will enable the U.S. Laboratory Destiny to be attached to Unity. The docking port then will be placed on the forward end of Destiny. Noriega and Tanner also moved the S-band antenna assembly to the top of the solar array tower and release restraints holding a radiator to the tower's side. Designed to help cool Destiny, the radiator was deployed after the space walk. The space walk lasted 6 hours, 37 minutes.

EVA No. 3 – A major task on this space walk was increasing tension on the solar array. By retracting the starboard wing, Noriega pulled the slack cables through each take-up reel. Tanner turned the spring-loaded tension reels then let them unwind while Noriega guided the cable onto the reel grooves, increasing the tension. In other activities, Tanner and Noriega installed a centerline camera cable outside the Unity module to transmit television images that will aid the next Shuttle crew to attach Destiny. They also installed the Floating Potential Probe, which measures the electrical potential of plasma around the Station. Following Earth-based construction tradition when a building reaches its final height, the astronauts attached an evergreen tree – the image was on a transfer bag – to the FPP in a symbol of “topping out” the Space Station. Get-ahead tasks included installing a sensor on a radiator and small antennas, and doing a photo survey.

This third space walk took 5 hours and 10 minutes, bring the total space walk time for the mission to 19 hours and 20 minutes. The total of space walk time outside the Space Station is now 88 hours and 54 minutes.

At 9:36 a.m. EST on Friday, Dec. 8, the crew paid the first visit to the Expedition One crew residing in the Space Station. Until then the Shuttle and the Station had kept one hatch closed to maintain respective atmospheric pressures, allowing the Shuttle crew to conduct their space walks and mission goals. After a welcome ceremony and briefing, the eight spacefarers conducted structural tests of the Station and its solar arrays, transferred equipment, supplies and refuse back and forth between the spacecraft, and checked out the television camera cable installed by Tanner and Noriega for the upcoming mission.

On Dec. 9, the two crews completed final transfers of supplies to the Station and other items being returned to Earth. The Endeavour crew said farewell to the Expedition One crew at 10:51 a.m. EST and closed the hatches between the spacecraft. After being docked together for 6 days, 23 hours and 13 minutes, Endeavour undocked from the Station at 2:13 p.m. EST. Piloted by Michael Bloomfield, it then made an hour-long, tail-first circle of the Station. The undocking took place 235 statute miles above the border of Kazakhstan and China. The final separation burn took place near the northeast coast of South America.

The final day was spent checking out the systems for landing and talking with reporters.